

REPORT OF THE
OFFICE OF THE AUDITOR GENERAL

219

EVALUATION OF COMPUTER UTILIZATION
AT THE UNIVERSITY OF CALIFORNIA

MARCH 1975

TO THE
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BOB WILSON
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ROOM 4126, STATE CAPITOL
SACRAMENTO, CALIFORNIA 95814
(916) 445-6161

March 20, 1975

The Honorable Speaker of the Assembly
The Honorable President pro Tempore of
the Senate
The Honorable Members of the Senate and the
Assembly of the Legislature of California

Members:

I am today releasing the report of the Auditor General on the use of computers at the nine campuses of the University of California. The audit was originally requested by Assemblyman Mike Cullen, Chairman of the California Information Systems Implementation Committee.

Presently, all nine campuses of the University system have their own Computer Centers, Computer Center directors, and staff to support the instructional and research computing activities within each campus. As of September 1974, the nine Campus Computer Centers supported 87,181 undergraduate, 25,437 graduate and 9,818 health science students for a combined total of 122,436 students in the University system.

The audit included an analysis of the instructional use of computers for students. Implicit in such use is that the quality of education will be enhanced. The audit did not attempt to evaluate the qualitative effect of computers on education, but proceeds on the assumption that educational enhancement does result. The audit analyzed whether such enhancement is being delivered in an efficient and economical manner.

The Honorable Members of the Legislature
of California
March 20, 1975
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The Auditor General's report has cited the following deficiencies:

- The University has procured some unnecessary computer equipment.
- Student computing needs are not being met. The \$12.47 of state funds which was allocated per undergraduate student for fiscal year 1974-75 is considerably below a minimum of \$60 per student for computer usage recommended by a 1967 task force report to the President of the United States.
- Computer facilities and equipment provided students at many campuses are inadequate. Computer equipment designated for student use is usually obsolete and student computer facilities are crowded.
- The University has incorrect procurement, inventory and accounting procedures relating to computers and in the case of procurement procedures there have been policy violations. For example, some campuses do not obtain competitive bids when purchasing computers.

Some of the reasons found by the Auditor General's staff for the problems noted above are as follows:

- There is a lack of adequate controls over the procurement of computers used for student instruction and faculty research since the present University purchasing policy allows campuses the prerogative of individually purchasing mini-computers costing less than \$100,000.
- There is a lack of knowledge by Deans and departmental Chairmen regarding computer funding for student instructional purposes.
- Many of the faculty members have received their formal education without specific knowledge regarding the use and application of computers.
- Computer Center and faculty research staff receive a higher priority on assignment of computer equipment and space than the students themselves.

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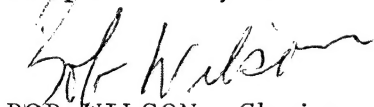
- Some campuses specify a brand name and model of computer in lieu of incorporating specifications which would lend themselves to competitive bidding. Improper computer inventory classifications result in numerous errors in the University property registers.

Chief recommendations resulting from the Auditor General's study include:

- Implementation of adequate controls over computer procurements by establishing inter-campus committees to review and approve all computer procurement requests
- Increase of the state appropriation for student instructional use of computing to a minimum of \$25 per undergraduate student in fiscal year 1975-76
- A review by all campuses of the computing facilities provided students for the purpose of correcting existing deficiencies relating to equipment and space
- Unless otherwise approved by the University's Executive Director of Computing, sole source procurement of computers should be prohibited and instead functional specifications should be used to effect competitive bidding.

The University's Executive Director of Computing and representatives of the University-wide Computer Policy Board have issued a response which is included in the Auditor General's report. While there is some disagreement, their response includes the statement, "On balance, the audit was fairly conducted and appears to be based on accurate facts."

Respectfully submitted,



BOB WILSON, Chairman
Jt. Legislative Audit Committee



STATE OF CALIFORNIA

GLEN H. (JACK) MERRITT, C.P.A.
CHIEF DEPUTY AUDITOR GENERAL

925 L STREET, SUITE 750
SACRAMENTO, CALIFORNIA 95814
(916) 445-0255

Office of the
Auditor General

HARVEY M. ROSE, C.P.A.
AUDITOR GENERAL

JERRY L. BASSETT
ATTORNEY-AT-LAW
DEPUTY-CHIEF COUNSEL

PHILLIPS BAKER, C.P.A.
GERALD A. HAWES
JOHN H. MCCONNELL, C.P.A.
DEPUTIES

March 20, 1975

Honorable Bob Wilson
Chairman, and Members of the
Joint Legislative Audit Committee
Room 4126, State Capitol
Sacramento, California 95814

Dear Mr. Chairman and Members:

Transmitted herewith is our report on the use of computers
at the nine campuses of the University of California.

Respectfully submitted,

Harvey M. Rose
Auditor General

Staff: Jerry. L. Bassett
Richard V. Alexander
Carla M. Duscha
Robert J. Maloney
Gary S. Ross
Dennis L. Sequeira
Nancy L. Szczepanik

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INTRODUCTION

In response to a legislative request, we have conducted a performance audit of computer utilization within the nine campuses of the University of California system. The audit included an analysis of the operation of facilities, instructional use of computers, control procedures and long-range planning.

Implicit in the instructional use of computers is that the quality of education will be enhanced by such use. This audit does not attempt to evaluate the qualitative effect of computer use on education. Rather, this audit proceeds on the assumption that educational enhancement does result. Our audit is an analysis of whether this enhancement is being delivered in an efficient and economical manner.

Throughout the duration of the assignment, we were favorably impressed with the businesslike attitude displayed by faculty and students. There appears to be a serious commitment to the process of education within the system. The excellent cooperation provided by the personnel at all nine campuses greatly assisted our efforts in this assignment.

In our judgment, implementation of our recommendations will result in more effective service of student computing use and will improve acquisition and use of computers within the University of California system.

Computing activities within the University of California system have steadily increased for the past 26 years. Primarily, computing activities are centered around administrative, research and instructional applications. During this time period, administrative computing has been developed separately from instructional and research computing and has operated in a more centralized form while research and instructional computing have been heavily decentralized.

Presently, all nine campuses of the University system have their own Computer Centers, Computer Center directors, and staff to support the instructional and research computing activities within each campus. As of September 1974, the nine Campus Computer Centers supported 87,181 undergraduate, 25,437 graduate and 9,818 health science students for a combined total of 122,436 students in the University system.

Following is a summary of the history and the current cost of computing at each University of California campus:

UC BERKELEY - The first computer at Berkeley was obtained in 1948 and in 1950 a computer laboratory was formed. By 1955, the computer laboratory had an annual budget of over \$50,000. Today, Berkeley's annual Computer Center operations budget is \$1.3 million to serve 20,469 undergraduate, 8,670 graduate and 591 health science students.

UC DAVIS - The Computer Center at Davis was formed in September 1960 from a \$40,000 National Science Foundation grant and operated under the Mathematics Department until July 1964 when it became an independent organization. Presently, the Davis computing budget is \$800,000 to accommodate 11,907 undergraduate, 2,845 graduate and 1,487 health science students.

UC IRVINE - Irvine computing activities began in the spring of 1965, six months prior to the first student enrolling. The campus has placed an emphasis on the study of information technology. Presently, Irvine's Computer Center operations budget is \$700,000. There are 6,865 undergraduate, 1,156 graduate and 743 health science students at UCI.

UC LOS ANGELES - UCLA served as the host organization to the National Bureau of Standards when the bureau organized its Institute for Numerical Analysis in 1948. In 1956, the Western Data Processing Center was established at UCLA in joint partnership with the University and IBM. In December 1957 the UCLA health science computing facility was formed and began operations with financing provided by the US Public Health Service. In April 1967, UCLA established the Campus Computing Network (CCN), which presently serves 20,612 undergraduates, 8,070 graduate and 3,284 health science students. The CCN operations budget is currently \$2.6 million.

UC RIVERSIDE - Computing was first introduced to Riverside in January 1961 when, with the aid of IBM, hardware was obtained for the Biometrical Laboratory, Citrus Experiment Station. A Computer Center was formed during the 1964-66 time period which today serves 3,723 undergraduate and 1,292 graduate students with a current computing budget of \$500,000.

UC SAN DIEGO - The UCSD Computer Center was originally established as a research facility in May 1960. In July 1961, the use of computing was introduced within the academic program. The Center has been steadily increasing in size and capability and presently services 6,932 undergraduate, 1,222 graduate and 721 health science students with a computer budget of \$1.6 million, most of which is federal grant funding.

UC SAN FRANCISCO - Computing began at UCSF in July 1961 through a National Institute of Health grant. In July 1965 the Computer Center was formed and was administratively removed from the Cancer Research Institute in the School of Medicine and designated a campus-wide unit. The facility presently serves 2,992 health science students with a computer budget of \$650,000.

UC SANTA BARBARA - The Computer Center at UCSB was initiated in November 1958 and in 1962 construction of a Computer Center as part of an existing building was completed. The Center was established under a National Science Foundation grant of \$50,000. Presently, operating with IBM hardware which was transferred from UCLA, the Computer Center operates on a budget of \$1 million and accommodates 11,421 undergraduate and 1,856 graduate students.

SANTA CRUZ - Computing at Santa Cruz began in 1966 when the Lick Observatory computer was made available for campus use. In 1968, with Regents funding and a National Science Foundation grant, computing hardware was upgraded and today the Computer Center operates on a budget of \$200,000 to serve 5,252 undergraduate and 326 graduate students.

State funds are allocated by the President's Office for the instructional use of computing for University of California students. These funds totaled \$1,209,619 in fiscal year 1974-75 which amount to \$12.47 for each undergraduate and health science student.

There is presently an Executive Director for Computing for the University system. This position was created in response to a University computer task force report of September 1973 and filled in June 1974. There also exists a University-wide Computer Policy Board which was established in October 1973 and there now exists a University-wide Academic Senate Committee on Computer Policy that was established in December 1974. Both committees have been formed to respond more effectively to computer developments in the University system.

FINDINGS

THERE IS A LACK OF ADEQUATE CONTROLS OVER
THE PROCUREMENT OF COMPUTERS USED FOR
STUDENT INSTRUCTION AND FACULTY RESEARCH
BY THE UNIVERSITY OF CALIFORNIA. AS A
RESULT, THE UNIVERSITY HAS PROCURED SOME
UNNECESSARY COMPUTER EQUIPMENT.

The University of California system operated 542 computers as of February 1975. This total excludes those machines located in the President's Office, Atomic Energy Commission laboratories and ships operated by the Scripps Institute of Oceanography.

The following table shows the number of computers for each campus.

Comparison of General Purpose
And Mini-Computers in the
Nine Campuses of the
University of California

	<u>Number of General Purpose Computers</u>	<u>Number of Mini-Computers</u>	<u>Total Computers</u>
Berkeley	1	135	136
Davis	1	39	40
Irvine	2	30	32
San Diego	3	126	129
San Francisco	1	40	41
Santa Barbara	1	26	27
Santa Cruz	2	14	16
Riverside	2	12	14
Los Angeles	<u>4</u>	<u>103</u>	<u>107</u>
TOTALS	<u>17</u>	<u>525</u>	<u>542</u>

Ninety-seven percent of the computers presently in the nine campuses are mini-computers. Of this percentage, the majority of the mini-computers are used for faculty research. Graduate students are sometimes hired to work on the faculty research projects and therefore receive some use of this equipment.

There is no universally accepted definition of a mini-computer. For the purposes of cataloging computers for this report, a mini-computer was generally deemed to be one with less than eight thousand positions of memory (or program capacity) and a lease cost of less than \$2,500 per month.

Though the program capacity of a mini-computer is not comparable to that of a large general purpose machine, recent technological developments in the mini-computer have given them wide applications in scientific research and have reduced, to some extent, the dependence on large computers.

The present University purchasing policy allows the individual campuses within the system the prerogative of purchasing computers costing less than \$100,000. Most mini-computers within the University system are in the category below \$100,000; and, therefore, are not subject to review by the President's Office. Because of this fact, control over the procurement of mini-computers is a campus responsibility.

There have been occasions when this control has been inadequate to prevent the procurement of unnecessary equipment. Examples of unnecessary or redundant equipment include two Nova 1200's at UC San Diego; a Hewlett-Packard 3000 at UC Riverside; and a Burroughs 5500 at UC Santa Cruz.

One of the reasons that controls are lacking is the absence of technical expertise at each campus which can be totally objective in evaluating the need for the equipment. In our judgment, the best method to ensure the objectivity in the process is to obtain a greater source of expertise from outside the campus. This can be accomplished through the creation of a committee of experts from all campuses in the system to objectively review all requests for computing equipment.

CONCLUSION

The lack of adequate controls over the acquisition of computers costing less than \$100,000 has resulted in the procurement of some unnecessary computer equipment.

RECOMMENDATIONS

We recommend that the University establish adequate controls over all computer procurements through the establishment of two inter-campus committees, comprised of faculty and staff representatives knowledgeable in computing applications, created to review and approve such procurements in the UC system. The committees should be comprised as follows: Northern committee - Berkeley, Davis, Santa Cruz and San Francisco; and Southern committee - Los Angeles, Riverside, Santa Barbara, San Diego and Irvine. Committee decisions made on requested purchases should be forwarded to the requestor with copies provided all affected organizations. Appeal of the committee's decision should only be resolved by the Executive Director of Computing.

BENEFITS

The imposition of adequate controls of computer procurements by an inter-campus committee of experts should prevent the procurement of unnecessary computer equipment.

STUDENT COMPUTING NEEDS
ARE NOT BEING MET.

Student computing needs are not being met in that the level of state funding is inadequate and inconsistently allocated, computer courses do not provide introductory instruction for both science and nonscience students at all campuses, and faculty knowledge in the use of computers is varied.

Funding for Instruction Use

In 1967, a White House task force report to the President reported on computing costs in higher education. The report recommended that at least \$60 per student per year be expended for computer usage by students in order that students could take advantage of this new discipline for instructional purposes. For fiscal year 1974-75, the President's Office of the University of California allocated state funds of \$12.47 per undergraduate student for the entire year, which is considerably below the 1967 recommendation.

Graduate students within the University system receive the majority of their computer usage through federally-funded faculty research projects.

Those students receiving the majority of the funding in the University system are in the hard sciences such as math, chemistry, physics, etc., or in curriculums where a faculty member involved in research has decided to use computing for instructional purposes. Based on the White House task force data, the present appropriation by the state to the University of California for the use of computing for student instruction is not adequate. Moreover, comparisons of expenditures by other universities, such as Stanford and Dartmouth, also indicate that state funding is inadequate.

More important, however, than comparisons of state funding to the White House task force recommendations or comparisons to other universities is the fact that on those campuses in the University system whose total funding was more nearly adequate than the systemwide average, significantly better instructional usage was observed.

Based on our review of individual campuses, it is our judgment that \$50 per undergraduate student per year is a reasonable amount for the University system to spend per student per year.

Methods of Allocating Computer Funding

When state funds are allocated from the President's Office, the funds are placed in an instruction and research fund. The distribution of the funds differs substantially within the nine campuses. At some campuses the distribution of instructional computing funds is accomplished through representative computer advisory committees (with student membership), and in close coordination with the campus' Academic Senate. In contrast, other campuses distribute these funds unilaterally through committees appointed by the campus' administration which have little representation from academic departments. Other campuses follow past levels of funding so that only the amounts change but the ratio remains the same. This procedure restricts the possibility of obtaining instructional computing funds for new applicants.

The lack of knowledge at the dean and the chairman of department levels regarding amounts of computer funding for student instruction purposes is a direct result of their having been left out of the allocation process. In turn,

this lack of knowledge limits faculty and student awareness of the computer funding allocations for student instruction.

The Office of the Executive Director of Computing of the University of California has not been responsible for recommending funding allocations for student instructional use of computing. The process utilized to determine the funding for each campus is based on a five-year old formula which is implemented by the Budgetary Planning Office of the University system. Further, no written policy exists for the use of Instructional Use of Computing (IUC) funds within the UC system. The funding for student instructional use of computing is \$1,209,619 for fiscal year 1974-75.

The following table shows by campus the student population, the allocations of instructional funds by the President's Office and further shows the average allocation per student.

University of California
President's Instructional Use of Computing Funds
Fiscal Year 1974-75

	<u>Undergraduate And Health Science Students</u>	<u>President's IUC Allocation</u>	<u>Average Allocation Per Student</u>
Berkeley	21,060	\$ 237,500	\$11.28
Davis	13,394	120,569	9.00
Irvine	7,608	332,506	43.70
UCLA	23,896	237,000	9.92
Riverside	3,723	51,312	13.78
San Diego	7,653	74,536	9.74
San Francisco	2,992	0	0
Santa Barbara	11,421	102,750	9.00
Santa Cruz	<u>5,252</u>	<u>53,446</u>	<u>10.18</u>
University-wide Total	<u>96,999</u>	<u>\$1,209,619</u>	<u>\$12.47</u>

As can be seen from the table on page 12, the disparities between the size of a campus' student population and the amount of funding allocated by the President's Office are obvious and result in local campuses having to augment funding for student instructional computing if they are able. It was found at each campus that significantly increased instructional funds are necessary to meet student computing needs.

Computer Courses

A necessary condition to using computers as an instructional aid for students is that the students have a fundamental knowledge of how to use a computer. Such knowledge, in our judgment, can best be acquired by an introductory course in computer use. Some campuses in the system provide such a course, others do not. In our review, we found that on those campuses which provided a general introductory course in computer use, the benefits from student instructional use of computers was significantly enhanced.

The majority of the Campus Computer Centers cannot offer classes for credit because they do not have academic personnel on their staffs. As a result, many of the existing introductory computing classes are located in the hard sciences. However, we found in cases where an introduction to computing course is given in math or engineering departments, that there is a strong tendency for social science students not to take the courses and the student instructional use of computers on that campus is reduced. However, on those campuses, such as Davis and Irvine, which offer introductory classes in computer use by non-science majors, the use of computers by such students as a learning device was enhanced.

Obviously, all campuses cannot offer a complete and totally comparable curriculum in computer technology. However, based upon our review of those campuses which do offer introductory courses in computer use and the resulting beneficial effect on student instructional use of computers, it is our judgment that an introductory course in computing should be offered to all students on a systemwide basis.

There is general support within the University system that a systemwide course offering for the introduction of students to computing is desirable. Funding constraints and the lack of approval by the University-wide Academic Senate are cited as the only reasons for not instituting such a program.

Faculty Knowledge and Use of Computers

Many of the faculty teaching in the University system have little or no computer knowledge and, consequently, are unable to use or explain computer applications in their particular subject matter. Many of the older faculty members received their formal education before the advent of the computer as a driving force throughout our economy as we currently know it. One campus has initiated a program (RESCUE) to teach faculty members certain aspects of computing.

Computer aided instruction (CAI) is a method by which a computer is used interactively to teach specific subject matter. Numerous CAI computer programs have been developed throughout the University system, the most notable ones are in physics, chemistry and medicine. Development of CAI programs is complex and costly. It has been estimated that 25 to 100 or more hours of

programming development is required for each hour of instruction obtained. The CAI programs are highly subject oriented (such as physics) and require very little computing knowledge on the part of the student. Because of the high cost of development of CAI and the applicability of use by any student enrolled in the particular subject, it would be desirable to share these programs among all campuses. However, little evidence of such sharing was found. Moreover, we observed indications that faculty development of CAI programs is not considered beneficial to a faculty member's scholarship development. As a result, some faculty members demonstrated a reluctance to invest the time necessary to develop CAI programs at the expense of more traditional research which would lead to promotion or tenure. During the course of our audit, we observed that CAI programs can be very beneficial.

CONCLUSION

Student computing needs are not being met.

RECOMMENDATIONS

We recommend that:

- The use of computers for student instruction at the University of California be funded by the state in fiscal year 1975-76 at a level of at least \$25 per undergraduate student per year, increasing to \$50 per undergraduate student per year as feasible. The present level of funding at UC Irvine would remain at \$43.70 per student until the systemwide average caught up.

- That the Academic Senate, through their committee on computing, perform an in-depth survey of all instructional computing offerings and computing curriculum requirements throughout the UC system.
- That procedures be drafted to ensure an equitable process for requesting instructional funds for computing. Each campus should implement such procedures so that obtaining and dispensing instructional funds for computing will be common to all and known to the entire University community.
- Each campus should provide information and assistance to faculty members on how to use and apply computers.
- The development of CAI programs be encouraged and that CAI programs that are developed be made available on a systemwide basis.

BENEFITS

- The appropriation of adequate funding and the implementation of proper procedures to distribute and utilize the funding will ensure that the use of computers for student instructional needs are met in the University system.
- The training of faculty in the proper use of computers will result in improved student instruction.

COSTS

Implementation of these recommendations will require an appropriation during fiscal year 1975-76 of approximately \$1.4 million in addition to the 1974-75 appropriation of \$1.2 million for increased use of computers for student instruction and an undetermined amount of funds to teach faculty members on the use and application of computers.

FACILITIES AND EQUIPMENT PROVIDED
STUDENTS AT MANY CAMPUS COMPUTER
CENTERS ARE INADEQUATE AND THE COSTS
ARE EXCESSIVE FOR SERVICES RECEIVED.

Campus Computer Centers have been established on each campus to meet the requirements for faculty research and student instructional needs. The service and equipment for student usage at many campuses are inadequate, yet the costs are the same as for faculty research use which receives adequate service and equipment.

Support Activities and Rate Charges

The Campus Computer Center rate structures prorate the salaries of consulting staff and other support personnel to all computer users as a portion of the machine charge rate. This practice discriminates against student users who receive little or no assistance from consultants, even though student computer usage accounts for 30 percent of all Computer Center charges.

Presently, salaries and fringe benefits represent 47 percent of the Campus Computer Center budgets. Included in these salaries are such functions as consultants, technical editors, librarians, clerks and budget personnel, as well as computer operators, equipment technicians and management. Reductions in the machine billing rate could be achieved at all campuses by a detailed analysis of workload and staffing requirements and removing positions not directly involved with operating or managing the Computer Centers from the basis for determining the machine billing rate.

Campus Computer Centers prorate system software development costs to all users as part of their computer charge rates. Some of this system software development does not benefit all users equally, particularly the students.

Our audit revealed that there has been only a minimum effort to evaluate personnel functions at the Campus Computer Centers in order to reduce machine rates through direct charge for support services or through a reduction in staff.

The Impact of Federal Regulations
On Campus Computer Centers.

The federal office of Management and Budget Circular A-21 (OMB-A21), Principles for Determining Costs Applicable to Research and Development Under Grants and Contracts with Educational Institutions, establishes procedures for determining the costs applicable to research and development work performed by educational institutions under grants from or contracts with the federal government. Presently, OMB-A21 is being retitled, Federal Management Circular 73-8, and responsibility for its content is being shifted from the Office of Management and Budget to the General Services Administration. The auditing and negotiating functions contained in the circular for the University of California System are the responsibility of the Department of Health, Education and Welfare (HEW), Region IX, San Francisco.

The primary impact of the OMB-A21 is that it does not allow the federal government to be charged a different rate for computer time from that charged other users. This means that federal grants or contracts with the University cannot be used to subsidize non-federal computing. To the University, this has been interpreted as restricting flexible fee setting. Therefore, computer time cannot be made available to students at rates lower than that charged the federal government.

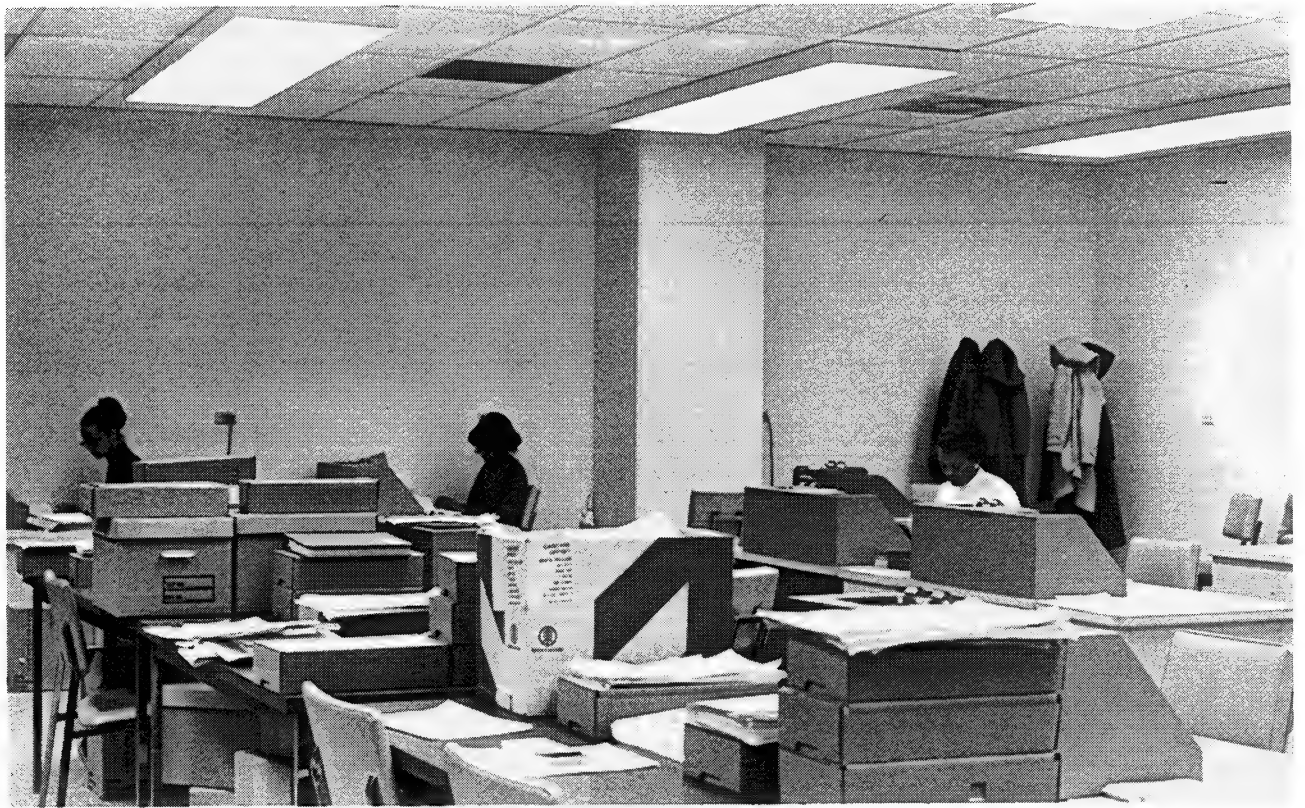
HEW representatives take the position that it is the responsibility of the University system and the state to provide the funding for more computer usage for students, rather than to give students reduced rates at the expense of the federal government.

Facilities for Student Computing

In many Campus Computer Centers, students are confined to cramped and inadequate quarters and are forced, because of the lack of facilities, to sit on hallway floors while performing their work or while they wait for access to keypunch machines. Equipment designated for student use is often insufficient and usually obsolete while similar equipment assigned for faculty research and other staff use is plentiful and up-to-date. Computer Center administrative personnel enjoy spacious quarters which are often physically removed from the crowding and noise which the students must endure.

In the assignment of computing facilities at many campuses, the students receive a priority significantly below that assigned to Computer Center staff.

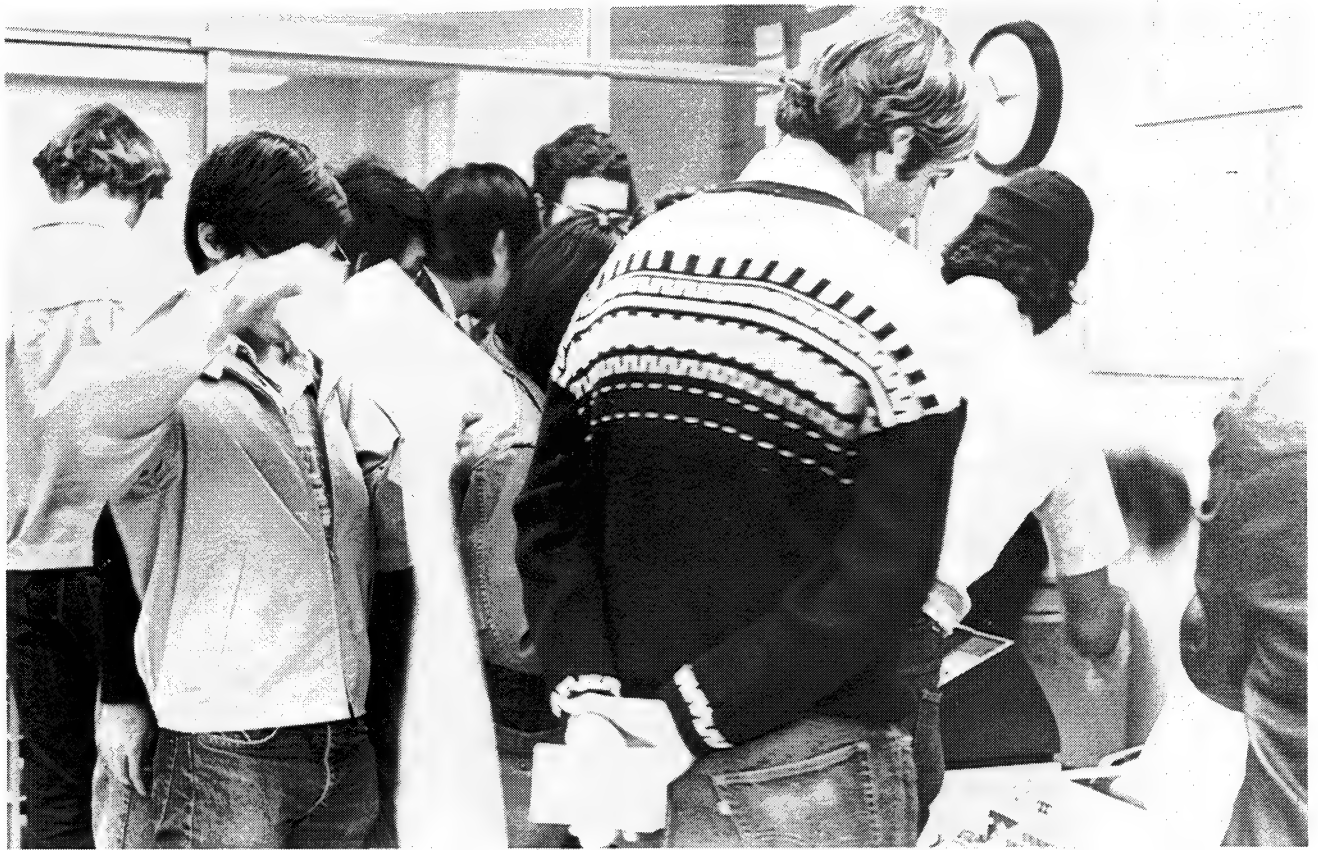
The following photographs taken at the Berkeley campus illustrate the inadequate computer facilities provided to students.



Administrative keypunch facilities at the University of California at Berkeley utilizing latest model equipment.



Student keypunch facilities at the University of California at Berkeley containing near obsolete equipment.



Crowded conditions at remote job entry stations at Cory Hall, University of California at Berkeley.



Student queues awaiting access to the job input station at the University of California at Berkeley computing center.

CONCLUSION

The equipment and facilities for student computing needs at many of the nine Campus Computing Centers are inadequate and the costs for the computing services rendered are excessive.

RECOMMENDATIONS

We recommend that:

- The Computer Center billing rates be purged of those amounts associated with the salaries of personnel not directly involved with operating or managing the Computer Center. Examples are consultants, technical editors, and engineering technicians.
- The individual campuses should evaluate their plant facilities for computing for the purpose of correcting existing deficiencies. Specifically, floor space and equipment allocated to students should be given first priority while the space assigned to staff should be relegated to a lesser importance.
- All system software development should be carefully evaluated and where appropriate should either be directly charged to a federal grant or to University funds instead of being prorated into the machine billing rate.

BENEFITS

Lower computing billing rates will result from the elimination of activities not directly involved with operating or managing the Computer Center. The direct charge of systems software development will result in closer scrutiny of this activity. Facilities and equipment designated for student usage will be commensurate with the high priority that should be assigned to their needs.

THE UNIVERSITY OF CALIFORNIA HAS INCORRECT
PROCUREMENT, INVENTORY AND ACCOUNTING PRO-
CEDURES RELATING TO COMPUTERS, AND IN THE
CASE OF PROCUREMENT PROCEDURES, THERE HAVE
BEEN VIOLATIONS OF THE UNIVERSITY'S POLICIES.

Procurement Procedures

An analysis of computer procurement procedures was made at seven campuses within the University of California system. It was found that some campuses frequently do not obtain competitive bids when purchasing computers. The failure to obtain competitive bids for computer purchases is in conflict with the procurement procedure as contained in University of California Business and Finance Bulletin No. 43. The bulletin states, "Competitive quotations must be secured for any transaction in excess of \$2,500 unless it has been determined that competition is impractical due to the unique nature of the item to be purchased." Most computing requirements can be satisfied by equipment from several vendors and in fact one campus has always competitively bid their computer procurements.

One of the main reasons for sole source procurement is that the requestor has conducted a market survey of available equipment, and then provides a sole source justification to procure the computer he has selected. The sole source justification is generally a highly technical document which is beyond the comprehension of the typical University buyer. When the purchasing department lacks technical knowledge of computers, they must rely on the judgment of the requestor as to whether the equipment is justified as a sole source item.

Another form of sole source procurement results from the practice of some campuses specifying the brand name and model of a computer "or equivalent" in lieu of incorporating functional specifications in the request for bid. Approximately 66 percent of the bid requests from the campuses surveyed were of this type. In many instances where a name brand was mentioned in the request for bids, only that single company responded. Over 85 percent of the awards were made to the company whose computer was specified in the request for bid.

Inventory Procedures

As of December 31, 1974, the computer account in the University property registers contained 662 entries. As a result of our analysis, 254 items were deleted from the account and an additional 134 items were added to provide a total of 542 computers which in our judgment represents the best reasonable total of computers within the University system.

The University accounts for all equipment costing more than \$200 at each campus by affixing a property number to each piece of equipment and recording the acquisition in a property register by class and type. Computers (central processing units), are recorded in the property register under class and type account number 66-9201. During the audit, due to improper computer inventory classifications, many errors were discovered in this account at each campus as shown in the June 30, 1974 property register listing. No attempt was made to locate errors in the peripheral computing equipment accounts.

Each April and October, the campuses are required to file with the Executive Director of Computing, a list of all computers on campus which are less than six years old. Some campuses assign this task to the Computer Centers and others to the Materials Management Unit. Errors were found on these lists due to the lack of a concise definition of a computer, the general inaccuracy of the property register, and the failure of departments to supply accurate information about their computers.

The University's Property Register System was acquired from the federal government in 1954 when computer technology was in its infancy. Accounts exist in the Property Register System for equipment common in 1954, but obsolete today. Some equipment in use presently was not yet developed in 1954 and, therefore, no classification for it exists in the system. The federal government later modified the system and since has replaced it. However, the University still uses the 1954 Property Register System.

The inadequacy of the Property Register System in the area of computers was recognized by the University several years ago. The University Materials Manager estimates that it would take two years and require approximately \$1 million to revise the entire Material Management Program. Limited funds were provided in fiscal years 1972-73 and 1973-74 to investigate new coding systems for supplies and equipment; however, no funding is now available nor has any been requested in the Governor's 1975-76 budget to implement these changes.

Accounting Procedures

Computers acquired from the federal government's excess property program are recorded in the University Property Register at the original cost to the federal government in lieu of being recorded at their fair market value when acquired. Generally, these machines are obsolete and worth at most only a nominal salvage value.

Frequently, funds from two or more sources are combined to purchase computing equipment. In one extreme case, funds from seven different sources including state, federal, university, and private were combined to purchase a \$35,700 computer. Since contributions from five of these funds totaled only \$6,142, it appears that, at least in this case, the funds were combined and spent for equipment to prevent small sums of money from reverting back to their original source.

Terms of grants and contracts frequently include the clause that legal title to any equipment purchased with these funds is to remain with the grantor. Three of the funds used in the above example were grants that included this clause. Legal ownership of this machine and many others purchased with mixed funds is unclear.

Excess capital outlay funds have been used to acquire computing equipment for facilities located in other than the building under construction. Departments located in the new buildings which have excess capital outlay funds have sometimes purchased computing equipment and transferred it to the Computer Center in exchange for "rental credits". These "rental credits" are then used to buy machine time. The departments receiving the "rental credits" are

then billed for the time available whether they use it or not.

CONCLUSION

The University of California does not adhere to correct procurement, inventory control, and accounting procedures for computers.

RECOMMENDATIONS

We recommend that:

- Sole source procurement of computers should be prohibited and the practice of specifying brand names should be replaced by functional specifications in requests for bid. Exceptions to this procedure should be approved by the Executive Director of Computing
- The Executive Director of Computing issue a concise definition of a computer to be used on each campus
- Each campus assign a staff member part-time to the Materiel Manager for technical assistance in the proper classification of the computer inventory
- Donated computers be recorded at their fair market value when acquired

- All grant and contract agreements should contain a provision that when University funds are used in conjunction with grant monies to purchase computers, the University receives clear title to the property at the conclusion of the grant project.

BENEFITS

Correct procedures for the purchase, inventory and accounting of computing equipment will permit more effective utilization and management of computing resources.

OTHER PERTINENT INFORMATION

The University of California is actively developing a University master plan for computing. The impact of such plan upon instructional and research programs are unknown because a cost-benefit analysis has not been completed by the University.

In response to a directive contained in Item 349 of the Budget Act of 1974-75, the University of California has been actively developing system-wide computer policies and a University-wide master plan for computing. Accomplishments to date include comprehensive policy guidelines in the area of acquisition and operation of computing equipment, networking and the establishment of University-wide facilities. In addition, University-wide task forces have been established to evaluate the requirements for a data communication network, use of mini-computers and implementation of a Bay Area Data Center.

Present efforts toward the completion of the master plan are in compliance with the language of the Budget Act of 1974-75. However, of equal importance is the need to perform a complete cost-benefit analysis of the impact of the plan upon student instruction and faculty research programs within the University system. As of the date of this report, no such cost benefit analysis has been completed.

The premature implementation of those parts of the plan that could cause disruption in existing facilities could injure the working relationships

that presently exist between faculty, students and the staffs of the Campus Computer Centers. Specifically, those parts of the plan that could cause disruption are the creation of University-wide computer facilities with the subsequent closing of some existing Campus Computer Centers.

The centralization of equipment in University-wide facilities may result in more efficient computing, but it may also be less responsive to student and faculty requirements. We assume that a thorough and comprehensive cost-benefit analysis will be made prior to implementation of any portion of the long-range plan for University computing.

SUMMARY OF COMMENTS OF THE UNIVERSITY'S
EXECUTIVE DIRECTOR OF COMPUTING AND
REPRESENTATIVES OF THE COMPUTER POLICY BOARD

Preamble

The following represents in general terms the University of California's preliminary response to the audit report entitled, "Evaluation of Computer Utilization at the University of California". On balance, the audit was fairly conducted and appears to be based on accurate facts. Many of the recommendations in the report are generally consistent with the University's policies on computing. The fact that similar conclusions were reached by independent auditors is very encouraging to those in the University responsible for developing computer policies. However, the University does have substantive differences with some of the specific audit findings.

It should be noted that the University had access to the report for about three hours as the auditors were not authorized to release (or the University duplicate) a copy prior to public release. Additionally, the time allotted for written response was slightly over 24 hours. Therefore, a more detailed, and possibly somewhat different, response may be developed by the University under a time frame which allows a more in-depth review of the report.

1. Control of Mini-Computer Procurement

Currently the Computer Policy Board has the responsibility for establishing policies for the acquisition of all computers in the University. Additionally, the Board specifically reviews each procurement request in the amount of \$100,000 and above.

With the continuing advantages of mini-computers, the University, and particularly the Computer Policy Board, concurs in the need to develop uniform policies, procedures, and standards for acquisitions below the \$100,000 level. The Computer Policy Board has established a task force with appropriate technical expertise to provide recommendations to the Board to further strengthen and clarify existing policies in the area of mini-computers. In this manner, the University intends to meet the audit recommendation for screening mechanisms for computer purchases below \$100,000, and will do so within the University's needs and policies.

The University does not agree that the cited instances can be accurately described as unnecessary equipment acquisitions. While there may be some instances where acquired equipment is being utilized in a different or less intensive manner from that projected at the time of acquisition, this in no way implies that the original requirement did not exist or that the acquisition was not justified at the time it was made. It would be surprising if in a dynamic environment, over 500 computers could all, over their useful lives of five years or more, be used for exactly the same purpose as they were acquired. Good management practice dictates that as requirements change, available equipment should be utilized in as efficient a manner as possible under the changed circumstances, or sold if the market value is higher than the value of the changed use.

2. Student Computing Needs

The audit conclusion that funding for instructional use of computers is inadequate to satisfy the current needs of students, is endorsed by the

University. The details of the recommendation to address this problem are subject to some disagreement, although the general direction is fully supported.

As immediate increment to \$25 per capita on those campuses which are below \$25 is in line with the University's long-range plan. Ultimately, however, in terms of current dollars, an appropriation of \$65 per student is the minimum requirement to provide adequate student access to computing. This is significantly below the White House task force report recommendation of \$60 per student, when a translation is made from 1967 to 1975 dollars.

The University has requested an IUC appropriation approximating the total amount specified by the auditors for 1975-76; however, graduate as well as undergraduate students are included in the University's base headcount. The University strongly believes that any appropriation formula on a per capita basis should include all student users, i.e., graduate students as well as undergraduates. In consonance with this approach, the total appropriation for 1975-76 should be revised to reflect the inclusion of graduate students. All graduate students depend on IUC funds for access to computers to meet their course requirements. In addition, graduate students in the social sciences and the humanities, where extramural funds are not readily available, have limited access to computing for their research. These needs cannot be left out of the IUC funding picture. On the whole, the audit's funding recommendation does go a long way toward meeting long unfilled instructional needs.

The audit recommendation regarding CAI is properly a matter of academic policy and will therefore be referred to the Academic Senate, together with the additional audit recommendation that the Academic Senate perform an in-depth survey of instructional computing offerings and computing curriculum requirements.

3. Student Computing Facilities and Equipment

The University does not agree that charges for student computing services are excessive for services received.

Current charging policies have been developed with the intent to be as equitable as possible to all users. Activities are included in Computer Center overhead only when they benefit all classes of users, including students, and the direct charge of these activities is not feasible within current operating or accounting practices. Nevertheless, the University will re-examine its current computer rate structure. Additionally, floor space and equipment allocation for student computer support are being reviewed.

4. Procurement, Inventory, Accounting

The University's procedures for procurement, inventory control, and accounting for computers can benefit from a general update and strengthening. This is, in fact, currently underway. However, to say that these procedures are not correct is inaccurate and presumably not the true intent of the audit team.

The University agrees that sole source procurement of computers should be carefully scrutinized to eliminate any possible abuses. However, it is far from clear that a particular mechanism such as functional specifications or outright prohibition subject to appeal will alone solve the problem. The University has underway an intensive review of the sole source issue with the goal of developing a more effective control mechanism.

The issue that all acquisitions should be recorded at fair market value is certainly not limited to donated computers, but extends to all University property. The University is attempting to develop a method for proper value determination and recordation which can be applied uniformly.

The issue of the ultimate title to computers purchased in part with University funds vesting in the University is real, but of small magnitude. Joint funding of computers is not widespread. However, the University does intend to review such purchases on a case-by-case basis and will resolve title questions on their merit and pursuant to applicable laws and policies.

Finally, it bears mentioning that each of the audit recommendations in this area has funding requirements prerequisite to its implementation. This is particularly true in the Property Management System area where lack of funds has been a primary restraint on improvement.

5. Other Pertinent Information

The University is in substantial agreement with the comments on the Master Plan for Computing. The need for complete cost-benefit justification for the Master Plan is fully endorsed and is being addressed prior to the plan's adoption.